

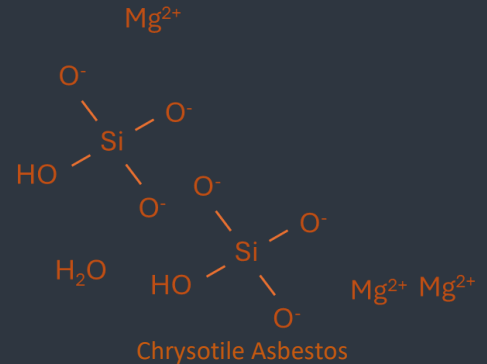
The proposal to designate "Asbestos" as this month's toxin...

...came from the Inhalation Toxicology Working Group of the GT. Although asbestos has been banned for more than 30 years, health risks associated with asbestos persist during renovation and demolition work.

With the ban on asbestos, the search for other equally effective fibers began. Advances in nanotechnology have led to the development of new materials, such as "Multiwalled Carbon Nanotubes" (MWCNT). Their risk assessments are conducted by analogy to asbestos or based on animal studies. However, the data for many fibers remains incomplete, which the experts in the Inhalation Toxicology Working Group consider critical. Large study groups are needed for epidemiologically significant studies, which are not available. Additionally, the transferability to humans is limited in animal experiments with fibers. A problem is that rats, commonly used in animal studies, breathe primarily through their noses and thus do not inhale many fibers during inhalation studies. Therefore, other application methods, such as intratracheal instillation, should be used for studying such fibers, which is often not the case.

MWCNTs

are cylindrical nanostructures characterized by their exceptional strength, electrical conductivity, and thermal stability. Their diameters range from 2 to 100 nm, while their lengths can be several micrometers. MWCNTs are used in many technical and medical fields today, such as in lithium-ion batteries. In animal studies, they have proven to be very strong carcinogens. However, there is currently a lack of precise knowledge about the length, thickness, or length-to-thickness ratio at which the pathological fiber effects begin, highlighting an urgent need for research to ensure safe handling.



Asbestos - From miracle material to a persistent problem

Since October 31, 1993, the use of asbestos has been banned in Germany. Nevertheless, the number of cases of people who fall ill or die from asbestos exposure has continued to rise until recent years. On one hand, this is due to the long latency period of up to 30 years between inhaling asbestos particles and the first appearance of symptoms. On the other hand, current exposures occur during the renovation of old buildings and the improper handling of asbestos-contaminated old materials.

Asbestos is a collective term for various naturally occurring silicate minerals. Due to its excellent material properties such as heat resistance, strength, and insulation capability, it was called the "mineral of a thousand possibilities" and has been used for over 100 years in industrial and consumer-related areas, being incorporated into more than 3,500 products. The health hazards of asbestos were already known at the beginning of the 20th century, and since 1942, lung cancer in connection with asbestosis has been recognized as an occupational disease in Germany. As early as the 1940s, initial measures were taken in Germany to prevent asbestos exposure. However, effective protective regulations were only introduced in 1972, which reduced asbestos exposure but did not completely eliminate the risk for workers.

The realization that comprehensive control over the entire lifecycle of asbestos products was not possible led to the complete ban on the production, marketing, and use of asbestos products in Germany in 1995. This ban was implemented throughout Europe in 2005. Not all asbestos fibers are equally carcinogenic; rather, there are significant differences in their toxicity. Crucial factors include the shape, size, and biological degra-

WHO fibers

are airborne particles of inorganic or organic materials that have an elongated shape. In addition to asbestos fibers, WHO fibers include glass fibers, organic fibers, and artificial mineral fibers. Toxicologically, fibers that are longer than 5 µm, have a diameter of less than 3 µm, and a length-to-diameter ratio of more than 3:1 are particularly significant. Such fibers can penetrate deep into the respiratory tract. Fibers with these characteristics are also referred to as WHO fibers. Technical rules published by the Federal Institute for Occupational Safety and Health (BAUA) ensure the proper handling of WHO fibers.

Moreover, the TRGS 905 classification characterizes the hazardousness through the introduction of a Carcinogenicity Index (CI). This is derived from the difference between the sum of the mass contents of the oxides of sodium, potassium, boron, calcium, magnesium, and barium, and twice the mass content of aluminum oxide. If this index is less than 30, the substance is defined as carcinogenic; if it ranges between 30 and 40, it is considered potentially carcinogenic; if the CI value is above 40, it is considered non-carcinogenic.

Asbestos production today

Despite the strong regulation or complete ban on the use of asbestos in many countries, asbestos continues to be produced and used in some regions of the world, especially in developing countries. Countries like Russia, China, and India remain leading producers and consumers of asbestos. This continued production and use not only pose a local problem but can also have global implications through the trade of asbestos-containing products.

ability of the fibers. Additionally, such fibers, depending on their length, often cannot be removed by alveolar macrophages. This is referred to as "frustrated phagocytosis," which causes cellular stress and the release of inflammatory mediators. Particularly, dust from long, thin, rigid, and biopersistent fibers that can penetrate deep into the lungs subsequently cause chronic inflammatory processes and severe respiratory diseases. However, asbestos remains the only fiber for which the carcinogenic effect in humans has been proven.

The WHO classifies all forms of asbestos as carcinogenic to humans. This assessment is based on extensive epidemiological studies that demonstrate a clear link between asbestos exposure and various types of cancer, particularly mesothelioma (a cancer of the mesothelium, the thin layer of tissue that covers many internal organs), lung cancer, as well as laryngeal cancer and, very rarely, ovarian cancer. Non-malignant diseases such as asbestosis, a progressive and fatal lung disease, are also direct consequences of inhaling asbestos fibers. The WHO's toxicological assessment is unequivocal: every form of asbestos poses a significant health risk, and there is no safe level of exposure.

When asbestos is bound within a material, the fibers do not pose a risk. However, if the structure breaks down due to material fatigue or during renovations, asbestos fibers can be released and become a health risk. Additionally, asbestos-containing materials are often installed covertly and distributed irregularly within buildings. Expertise is therefore necessary to identify asbestos installations. After the removal of asbestos-containing materials, they must be collected and disposed of as hazardous waste accordingly.

Once asbestos fibers are released, they can remain in the ambient air for years, be inhaled, and thus become a risk, which must be urgently avoided.

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Literature and links:

- [BAUA 2018 nationales-asbest-profil-deutschland.pdf](#)
- [leitlinie asbesterkundung der bob 2020-web.pdf \(umweltbundesamt.de\)](#)
- [BAuA - Regelwerk - TRGS 905 Verzeichnis krebserzeugender, keimzellmutagener oder reproduktionstoxischer Stoffe - Bundesanstalt für Arbeitsschutz und Arbeitsmedizin](#)
- [Asbest | Umweltbundesamt](#)
- [Foto von Carl Tronders auf Unsplash](#)